



straw or corn stover, payments for being enrolled in Conservation Reserve (CRP) or Wetland Reserve (WRP) Programs, payments from other government programs, rental of buildings or dwellings, royalties received for mineral production, and payments for easements for wind turbines, pipe lines or other uses. Timber could provide some income from selling trees for logging. Possible crop insurance indemnity payments should not be included in expected income, because they would be received only in years in which yields and/or prices are below expectations.

Production costs include standard inputs such as seed, fertilizer and pesticides, machinery and labor costs, crop insurance premiums, miscellaneous costs such as soil testing and crop scouting, and marketing expenses. Short-term interest costs on funds tied up in crop expenses should also be included. Average farm custom rates can be substituted for machinery and labor costs if those costs are not well known on a per acre basis, or if the land will be farmed under a custom farming agreement. Note that the opportunity costs of the operator's own labor and capital should be included, even if these do not represent cash costs, because these resources could be employed in some other enterprise.

Certain costs that come about just by owning the land also should be included. These include real estate taxes, insurance, and upkeep of terraces, tile lines, fences, and buildings. Depreciation costs on any new improvements that will have to be made to the land in order for it to produce the expected level of income, such as extra machinery, tile lines, fences, or terraces, should also be included. Note that land ownership costs do not include the original purchase cost of the land nor payments made on loans that might be secured to make the purchase.

The expected net income from the land, "I", is the sum of the expected gross revenue per acre minus variable costs for each crop, multiplied by the expected acres of that crop, plus any other sources of income, minus land ownership costs. Keep in

mind that not all acres in a tract of land will be suitable for producing crops. Estimates of income and expenses should be based on tillable acres and pasture, only, even though a buyer will have to pay for all the acres.

$$\begin{aligned}
 & \text{expected gross revenue from crops per acre} \\
 & - \text{variable costs per acre} \\
 & \times \text{expected crop acres} \\
 & + \text{other sources of income} \\
 & - \text{land ownership costs} \\
 & = \text{expected net income to land}
 \end{aligned}$$

**Non-operating Owner.** Sometimes farmland will be purchased as an investment and rented to a tenant operator. The simplest way to estimate income from renting land is to look at current cash rental rates for farms of similar quality in the same geographic area. Keep in mind that if current price levels are above or below long-term averages, current rental rates may have to be adjusted upward or downward to reflect long-run prospects. Survey information about cash rental rates is available from several sources, including *AgDM File C2-10, [Cash Rental Rates for Iowa Survey](#)*. The estimated rental rates per bushel or per CSR2 index value can be used to adjust county average rents to a reasonable value for a specific tract. Table 1 shows an example of how the cash rents for particular parcels can be estimated. Keep in mind that rent is typically received only for the tillable acres or acres in pasture.

Some landowners prefer to rent their land under a crop-share lease or hire a custom operator to perform machinery labor operations. In those cases the net income accruing to the landowner can be estimated as shown above, but including only the share of income received by the owner and only the share of production costs paid by the owner. Any of these arrangements can be analyzed using *AgDM Decision Tool C2-70, [Farmland Purchase Analysis](#)*.

Regardless of the type of lease or operating agreement used, the landowner will still have certain ownership costs to pay, as discussed earlier. These include property taxes, maintenance of improvements, and insurance.

**Rate of Return**

There are two approaches for estimating a value for “R”, the expected rate of return for an investment in farmland.

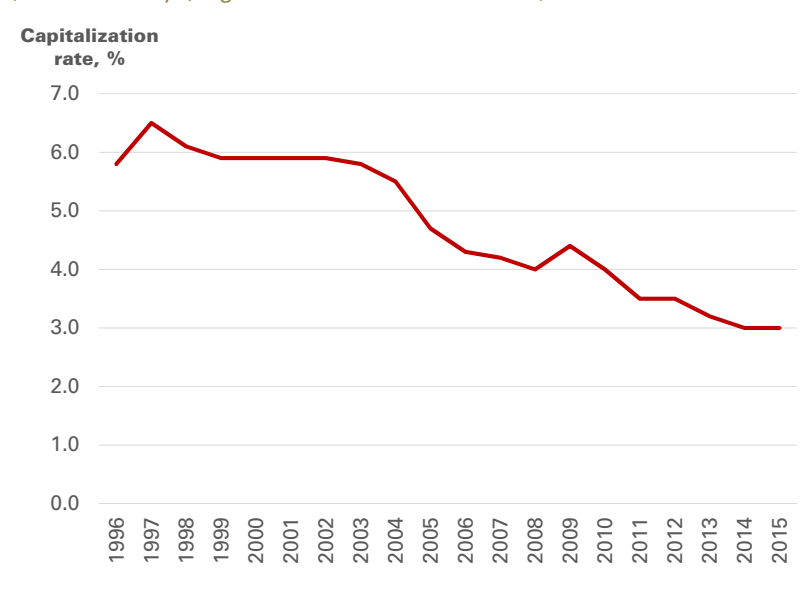
**Capitalization Rate.** The observed ratio of net cash rent to the sale price of farms that have been sold or appraised recently is called the capitalization rate. Sales of farms that are similar in quality and location to the farm for which a value is being estimated are called **comparative sales**. Farm appraisers maintain data banks of comparable farm sales in their territory. Sales information is also available from “Declaration of Value” certificates that are filed at county recorders’ offices and from several private sources.

To estimate the net income to be received, the estimated cash rent that would be paid for each comparable sale property is added to any extra income that might accrue to the property owner (not the tenant), and land ownership costs are subtracted. This value is then divided by the recorded sale price of the comparative property to find the capitalization rate. After the ratios for several properties have been obtained, an average value for the capitalization rate in that area and for that time period can be calculated. Table 1 shows an example.

Finally, the estimated annual net income (cash rent plus other income minus ownership costs) for the property being analyzed is divided by the average capitalization rate to obtain an estimate of the current market value of the property. Looking at it another way, this is the price that could be paid for the farm and earn the same rate of return on investment as purchasers of other farm properties are currently earning.

Figure 1 shows the ratio of cash rent to land value in recent years, based on statewide average values in Iowa. Note that this ratio has been declining, due mostly to lower interest rates. That

**Figure 1. Cash rent as a percent of farmland value, Iowa**  
(USDA Surveys, Ag Decision Maker File C2-09)



**Table 1. Capitalization rate example**

	Property 1	Property 2	Property 3	Property 4
(1) Number of tillable acres	38	148	217	123
(2) CSR2 rating	77	84	90	88
(3) Cash rent per CSR2 value in county (survey)	\$3.60	\$3.29	\$3.34	\$3.07
(4) Estimated cash rent for property, (2) x (3)	\$277	\$276	\$301	\$270
(5) Estimated ownership costs (15% of rent)	\$42	\$41	\$45	\$41
(6) Net return to owner per acre, (4) – (5)	\$235	\$235	\$256	\$229
(7) Net return per acre x tillable acres, (6) x (1)	\$8,930	\$34,780	\$55,552	\$28,167
(8) Recorded sale value	\$329,500	\$1,388,000	\$1,821,600	\$1,182,320
(9) Net rent as % of sale value, (7) / (8)	2.71%	2.51%	3.05%	2.38%
<b>(10) Average % net rent (capitalization rate)</b>	<b>2.66%</b>			

is, investors are willing to accept a lower rate of return (i.e. pay more) for land because the cost of borrowed capital is low and potential returns from other investments are also low. This ratio shows the rate of return before land ownership costs are paid. The actual net return is probably 0.5 to 1.0 percentage points lower than this, depending on how many improvements must be maintained.

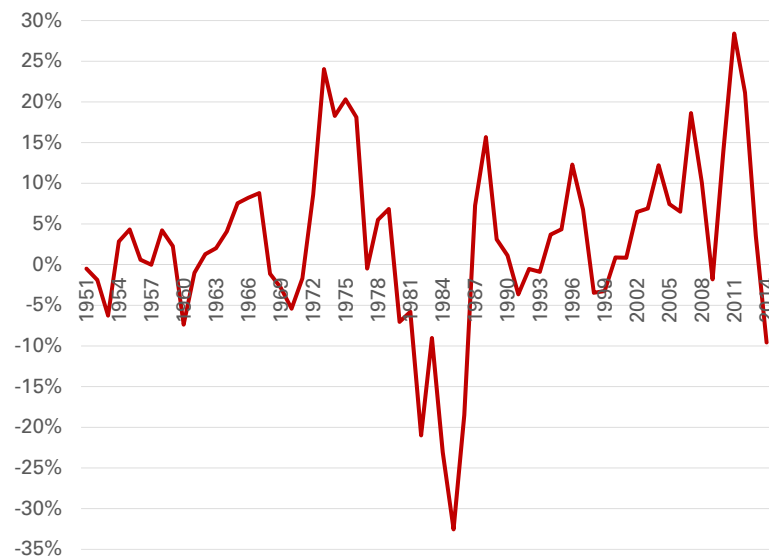
**Cost of Capital.** An alternative approach to estimating a value for “R” is to calculate the **cost of capital** for a potential buyer. A land buyer can use debt capital (borrowed funds) or equity capital (savings), or a combination of the two, to finance a purchase. The cost of debt capital is simply the interest rate that would be charged on a long-term loan. The cost of equity capital is the rate of return that could be earned in some alternative use of similar riskiness, often just the actual return on investment from farm assets that are already owned. The proportion of the total purchase price that will be funded from each source is used to calculate the weighted cost of capital. For example, if 60% of the purchase cost will be borrowed at a 6% interest rate, and the other 40% will come from equity capital that is currently earning a 5% return, the weighted cost of capital is  $(.60 \times 6\%) + (.40 \times 5\%) = 5.6\%$ .

Many people purchase farmland for its potential to appreciate in value as well as for its annual net income. The total economic return on investment is actually the sum of the net income and the annual appreciation. For example, if an annual appreciation rate of 2% is expected, then only a cash return of 3.6% would be needed to provide a total return of 5.6%. Note that land will usually appreciate at a certain rate simply due to inflation in the economy, that is, a general rise in prices and costs over time. The general rate of inflation is already implicitly included in the interest rate on capital. Reasons why farmland might appreciate

faster than the general rate of inflation include introduction of production enhancing technology, higher real prices for farm commodities due to population growth or new uses, and competition for other uses for the land such as for recreation or urbanization. Therefore, the **real** cost of capital is the weighted nominal cost minus the expected long-run rate of farmland appreciation in excess of general inflation in the economy.

Agriculture in the United States has undergone several cycles during which farmland values have increased at double-digit rates for several years. Care must be taken to not be unduly influenced by such high growth rates, though. Often periods of high appreciation in land values have been followed by years of stagnant or even declining values. Figure 2 shows typical annual rates of appreciation in Iowa farmland values over a long period of time, net of inflation. The average rate of increase in farmland values in Iowa since 1950, based on the annual Iowa State University Land Value Survey, has been 6.4%. However, the annual rate of inflation in the U.S. economy based on the Consumer Price Index has averaged 3.7%, so the **real** rate of increase in land values over this time period has been the difference between these two rates, or 2.7%.

**Figure 2. Annual increase in Iowa farmland values, net of inflation** (from ISU land value surveys and Consumer Price Index)



Small changes in interest rates or the expected rate of appreciation can cause a large change in the estimated economic value of land. A capitalization rate based on simply the **observed** rate of return to recent land purchases is probably a more reliable estimate for “R” in the present value formula. It represents an average rate of return across a range of purchasers. The cost of capital, on the other hand, will vary depending on the circumstances of the prospective buyer, and will produce an estimate of the value of a tract of land to that particular individual.

### Examples

Table 2 shows an example of how a prospective buyer who intends to farm a tract of land would estimate its economic value. The tract has 160 acres, of which 150 are tillable, and the expected rotation is half corn, half soybeans. The buyer uses typical average yields for the area and conservative long-term selling prices of \$4.00 per bushel for corn and \$9.00 per bushel for soybeans. No other sources of revenue are anticipated. Expected gross revenue is \$92,475 annually. Variable costs of production are estimated at \$54,000, and the cost of real estate taxes and upkeep is estimated at \$6,500 annually, leaving a net return to the

**Table 2. Owner-operator example: tract of 160 acres, 150 acres tillable, corn/soybean rotation**

	<u>Corn</u>	<u>Soybeans</u>	<u>Total</u>
Number of planted acres	75	75	
Expected yield, bushels per acre	180	57	
Expected sale price, \$ per bushel	\$4.00	\$9.00	
Gross revenue from crop sales per acre	\$700	\$495	
Total expected gross revenue from crops	\$54,000	\$38,475	\$92,475
Other cash income expected			<u>0</u>
Total gross revenue			\$92,475
Cost of seed, fertilizer, pesticides per acre	\$280	\$150	
Cost of machinery and labor per acre	125	50	
Cost of drying, hauling and handling per acre	50	6	
Crop insurance premiums	15	10	
Miscellaneous costs per acre	10	6	
Interest on variable costs (5% for 9 months)	<u>12</u>	<u>6</u>	
Total variable costs per acre	\$492	\$228	
Total variable costs on all acres	\$36,900	\$17,100	\$54,000
Real estate taxes and insurance			\$5,000
Upkeep of improvements			1,500
Annual cost of added improvements or machinery			<u>0</u>
Total ownership costs			\$6,500
Expected net income from land (\$92,475 – \$54,000 – \$6,500)			\$31,975
Observed capitalization rate (average from Table 1)			2.66%
Estimated economic value of the property (\$31,975 / 0.0266)			\$1,202,068
Estimated economic value per total acre (\$1,202,068 / 160 acres)			\$7,513

owner-operator of \$31,975. Dividing this value by the observed current capitalization rate of 2.66% from the example in Table 1 gives an estimated value of \$1,202,068 for this tract of land, or \$7,513 per acre for the entire tract, including the 10 non-tillable acres.

Table 3 shows an analysis of the same tract of land, assuming it will be purchased and rented out for \$280 per tillable acre. Gross rent to be received by the owner will be \$42,000 per year. The owner will still have ownership costs of \$5,000 for real estate taxes and \$1,500 for upkeep of improvements. In addition, a management fee equal to 8% of the cash rent is included, or \$3,360. This could be the fee paid to a professional farm manager (the actual fee charged will vary), or the opportunity cost of the owner's own time and effort spent managing the property. The net annual return to the owner is estimated to be \$32,140. Dividing by the capitalization rate of 2.66% gives an estimated economic value of \$1,208,271, or \$7,552 per total acre, very close to the estimated value for an owner-operator.

### Summary

The economic value of a tract of farmland can be estimated by dividing the expected annual net return that would accrue to owning and operating it or renting it out by the expected rate of return on similar properties. For individual situations the real cost of capital can be substituted for the capitalization rate. This estimate does not take into account the value a potential buyer might place on a particular piece of property due to sentimental, esthetic or other personal reasons. Such non-economic considerations may increase the amount a buyer is willing to pay for a particular tract of land.

For a discussion of the financial considerations for purchasing farmland, see *AgDM File C2-77, [Evaluating a Land Purchase Decision: Financial Analysis](#)*. For an electronic spreadsheet tool for analyzing land purchases see *AgDM Decision Tool C2-70, [Farmland Purchase Analysis](#)*.

**Table 3. Non-operating landowner example: tract of 160 acres, 150 acres tillable, under a cash rent lease**

Expected cash rent: \$280 per tillable acre x 150 acres	\$42,000
Other cash income expected	0
Total gross revenue	\$42,000
Ownership costs	
Real estate taxes and insurance	\$5,000
Upkeep of improvements	\$1,500
Management fee (8% of cash rent)	<u>\$3,360</u>
Total ownership costs	\$9,860
Expected net income from land	\$32,140
Observed capitalization rate	2.66%
Estimated economic value of the property (\$32,140 / .0266)	\$1,208,271
Estimated economic value per total acre (\$1,208,271 / 160)	\$7,552

### . . . and justice for all

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